THE INSTITUTE OF PAPER CHEMISTRY

Appleton, Wisconsin

PERFORMANCE OF EXPERIMENTAL MODEL FLUTER DURING DECEMBER THROUGH FEBRUARY AND ADDITIONAL COMPARISONS OF RACK AND COMB MODIFICATIONS

Project 1108-11

Preliminary Report Two

to

the Technical Committee

FOURDRINIER KRAFT BOARD INSTITUTE, INC.

March 16, 1960

TABLE I

CONCORA FLAT CRUSH FOR DECEMBER

USING EXPERIMENTAL FLUTER

Date	Concora Flat Crush, p.s.i. Roll 3521 Average	Roll 3521 Range	Roll 3471 Average	Roll 3471 Range	Roll 3485 Average	Roll 3485 Range	Roll 3513 Average	Roll 3513 Range
12- 2	41.58	6.6	37.47	6.0	33.99	4.8	48.09	9.0
12- 9	40.98	6.0	36.00	5.4	33.15	4.8	48.06	12.0
12-14	40.89	4.8	37.23	4.2	33.84	3.6	49.35	7.8
Average	41.15	5.8	36.90	5.2	33.66	4.4	48.50	9.6
2-Sigma Limits								
Upper	41.85	8.1	37.52	7.2	34.19	6.1	49.65	13.3
Lower	40.45	3.5	36.28	3.2	33.13	2.7	47.35	5.9

TABLE II

CONCORA FLAT CRUSH FOR JANUARY

USING EXPERIMENTAL FLUTER

1- 4	42.75	7.8	35.91	10.8	32.88	3.6	48.63	14.4
1- 6	40.35	5.4	36.00	4.8	32.25	3.6	47.61	10.8
1- 8	41.34	6.0	37.14	7.2	32.34	3.6	49.92	10.8
1-11	41.34	7.8	36.06	5.4	32.97	5.4	46.50	9.0
1-13	40.05	6.0	36.69	4.2	32.58	4.2	48.96	16.8
1-15	39.63	10.2	36.00	4.2	31.89	4.8	46.89	9.6
1-18	39.18	7.2	35.46	4.2	31.47	5.4	48.00	8.4
1-20	38.16	4.8	33.24	5.4	30.36	2.4	46.11	12.6
1-22	38.97	6.0	35.37	4.8	31.59	4.2	46.35	11.4
1-25*	38.40	10.8	34.65	3.6	30.78	3.6	46.59	7.8
1-27	39.78	7.8	36.09	4.8	31.26	3.0	48.18	7.8
1-29	40.89	6.6	36.42	6.6	32.13	4.2	48.93	9.6
Average	40.07	7.2	35.75	5.5	31.88	4.0	47.72	10.8
2-Sigma Limits								
Upper	40.93	10.0	36.41	7.6	32.36	5.6	49.02	15.0
Lower	39.21	4.4	35.09	3.4	31.40	2.4	46.42	6.6

* Machine cleaned after testing on January 25.

TABLE III

CONCORA FLAT CRUSH RESULTS FOR FEBRUARY

USING EXPERIMENTAL FLUTER

	Concora Flat Crush, p.s.i.							
	Roll 3521		Roll 3471		Roll 3485		Roll 3513	
Date	Average	Range	Average	Range	Average	Range	Average	Range
2-1	40.86	7.2	36.60	6.6	31.86	5.4	49.65	10.8
2-3	40.83	6.0	36.33	6.6	32.94	2.4	48.57	8.4
2-8	39.15	8.4	35.73	6.6	31.86	4.8	47.70	13.2
2-10	41.52	6.0	36.87	3.6	32.94	5.4	48.60	12.6
2-12	40.35	7.2	35.58	4.8	32.91	4.2	50.91	16.2
2-15	42.00	6.0	37.02	6.0	32.13	4.2	49.53	7.8
2-22	41.52	7.8	38.10	6.6	33.21	4.2	52.17	10.2
2-24*	42.00	9.6	38.04	7.2	33.27	3.6	50.40	9.6
Average	41.03	7.3	36.78	6.0	32.64	4.3	49.69	11.1
2-Sigma Limits								
Upper	41.91	10.1	37.50	8.3	33.16	6.0	51.02	15.4
Lower	40.15	4.5	36.06	3.7	32.12	2.6	48.36	6.8
3- 2	41.31	9.6	37.56	6.0	31.86	3.6	45.03	10.8
3- 4	40.02	5.4	36.93	6.0	32.52	4.2	48.60	10.2

* Machine cleaned after testing on February 24.

TABLE IV

FLUTE HEIGHT RESULTS FOR DECEMBER

USING THE EXPERIMENTAL FLUTER

	Flute Height (Fifth Flute), points							
	Roll 3521		Roll 3471		Roll 3485		Roll 3513	
Date	Average	Range	Average	Range	Average	Range	Average	Range
12- 2	201.6	5.0	202.2	2.5	201.6	3.5	200.3	5.5
12- 9	201.4	3.5	202.0	5.5	201.6	3.5	199.6	6.5
12-14	201.1	4.0	202.2	4.5	202.2	3.5	200.2	5.5
Average	201.4	4.2	202.1	4.2	201.8	3.5	200.0	5.8
2-Sigma Limits								
Upper	201.9	5.8	202.6	5.8	202.2	4.9	200.7	8.1
Lower	200.9	2.6	201.6	2.6	201.4	2.1	199.3	3.5

TABLE V

FLUTE HEIGHT RESULTS FOR JANUARY

USING THE EXPERIMENTAL FLUTER

1- 4	201.9	3.5	202.0	4.0	202.1	3.5	197.8	8.0
1- 6	201.1	5.0	201.4	4.0	201.6	4.0	199.6	8.5
1- 8	201.2	3.0	201.6	2.5	201.8	4.0	198.6	11.0
1-11	201.0	4.0	202.0	3.5	202.0	4.0	200.6	5.0
1-13	202.2	4.0	202.0	4.5	202.5	3.0	200.1	11.5
1-15	201.2	4.0	202.4	3.5	202.2	5.0	200.3	13.5
1-18	201.8	2.5	202.7	2.5	202.0	3.5	198.8	11.0
1-20	201.4	3.5	202.2	3.0	202.0	2.5	201.5	13.0
1-22	201.6	3.0	202.2	4.5	202.2	3.5	200.1	9.5
1-25	202.0	3.0	202.0	2.0	202.0	2.5	200.2	8.0
1-27	201.9	3.0	202.0	3.0	202.1	3.5	198.6	8.5
1-29	201.2	5.0	202.4	3.5	202.7	3.0	197.1	10.0
Average	201.5	3.6	202.1	3.4	202.1	3.5	199.4	9.8
2-Sigma Limits								
Upper	201.9	5.0	202.5	4.7	202.5	4.9	200.6	13.6
Lower	201.1	2.2	201.7	2.1	201.7	2.1	198.2	6.0

TABLE VI

FLUTE HEIGHT RESULTS FOR FEBRUARY

USING THE EXPERIMENTAL FLUTER

	Flute Height (Fifth Flute), points							
	Roll 3521		Roll 3471		Roll 3485		Roll 3513	
Date	Average	Range	Average	Range	Average	Range	Average	Range
2- 1	201.8	1.5	201.7	2.5	201.7	2.5	198.6	11.5
2- 3	201.2	3.5	202.0	1.5	201.8	3.0	199.3	11.5
2- 8	201.5	2.5	201.6	3.5	201.6	2.0	196.5	13.0
2-10	200.9	3.5	201.9	2.5	201.2	3.5	198.8	10.0
2-12	201.9	3.0	201.9	2.5	201.8	3.0	196.4	11.5
2-15	201.1	4.5	202.1	3.5	201.8	4.5	200.1	12.0
2-22	200.8	5.5	201.4	6.5	201.4	3.5	191.2	11.5
2-24*	200.2	5.0	201.3	4.5	200.5	4.5	194.6	12.0
Average	201.2	3.6	201.7	3.4	201.5	3.3	196.9	11.6
2-Sigma Limits								
Upper	201.6	5.0	202.1	4.7	201.9	4.6	198.3	16.1
Lower	200.8	2.2	201.3	2.1	201.1	2.0	195.5	7.1
3- 2	201.6	3.0	201.2	7.0	202.0	1.5	194.4	15.0
3- 4	201.4	4.5	202.0	2.5	201.8	2.5	197.2	11.5

* Machine cleaned after testing on February 24.

TABLE VII

SUMMARY OF FLAT CRUSH DATA BY MONTH

Month	No. of Subgroups	Roll 3521 p.s.i.	Roll 3521 Difference, %[a]	Roll 3471 p.s.i.	Roll 3471 Difference, %[a]	Roll 3485 p.s.i.	Roll 3485 Difference, %[a]	Roll 3513 p.s.i.	Roll 3513 Difference, %[a]
September	13	40.49	--	36.10	--	32.88	--	48.07	--
October	9	41.24	+1.9	36.40	+0.8	33.01	+0.4	47.95	-0.2
November	12	40.47	-0.00	36.19	+0.2	32.80	-0.2	47.48	-1.2
December	3	41.15	+1.6	36.90	+2.2	33.66	+2.4	48.50	+0.9
January	12	40.07	-1.0	35.75	-1.0	31.88	-3.1	47.72	-0.7
February	8	41.03	+1.3	36.78	+1.9	32.64	-0.7	49.69	+3.4
Weighted average		40.63		36.23		32.68		48.10	

[a] Based on September results as reference.

TABLE VIII

SUMMARY OF FLUTE HEIGHT DATA BY MONTH

Month	No. of Subgroups	Roll 3521 points	Roll 3521 Difference, %[a]	Roll 3471 points	Roll 3471 Difference, %[a]	Roll 3485 points	Roll 3485 Difference, %[a]	Roll 3513 points	Roll 3513 Difference, %[a]
September	13	203.1	--	204.4	--	203.5	--	202.0	--
October	9	202.3	-0.4	202.9	-0.7	202.7	-0.4	200.1	-0.9
November	12	201.6	-0.7	202.2	-1.1	201.7	-0.9	200.1	-0.9
December	3	201.4	-0.8	202.1	-1.1	201.8	-0.8	200.0	-1.0
January	12	201.5	-0.8	202.1	-1.1	202.1	-0.7	199.4	-1.3
February	8	201.2	-0.9	201.7	-1.3	201.5	-1.0	196.9	-2.0
Weighted average									
Sept. thru Feb.		202.0		202.7		202.3		199.9	
Oct. thru Feb.		201.6		202.2		202.0		199.3	

[a] Based on September results as reference.

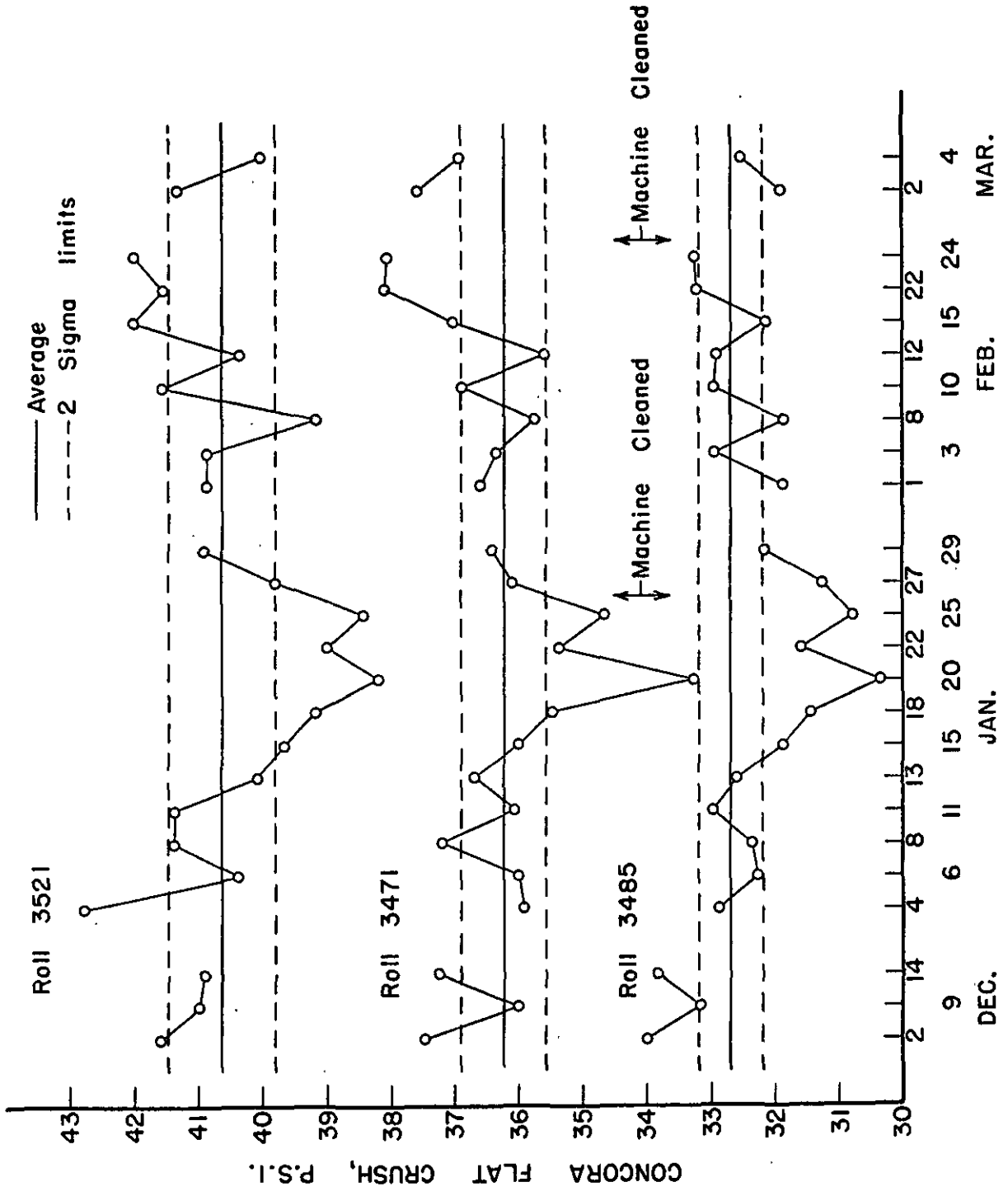

Fig. 1. Concora Flat Crush Results for 26-lb. Medium Samples

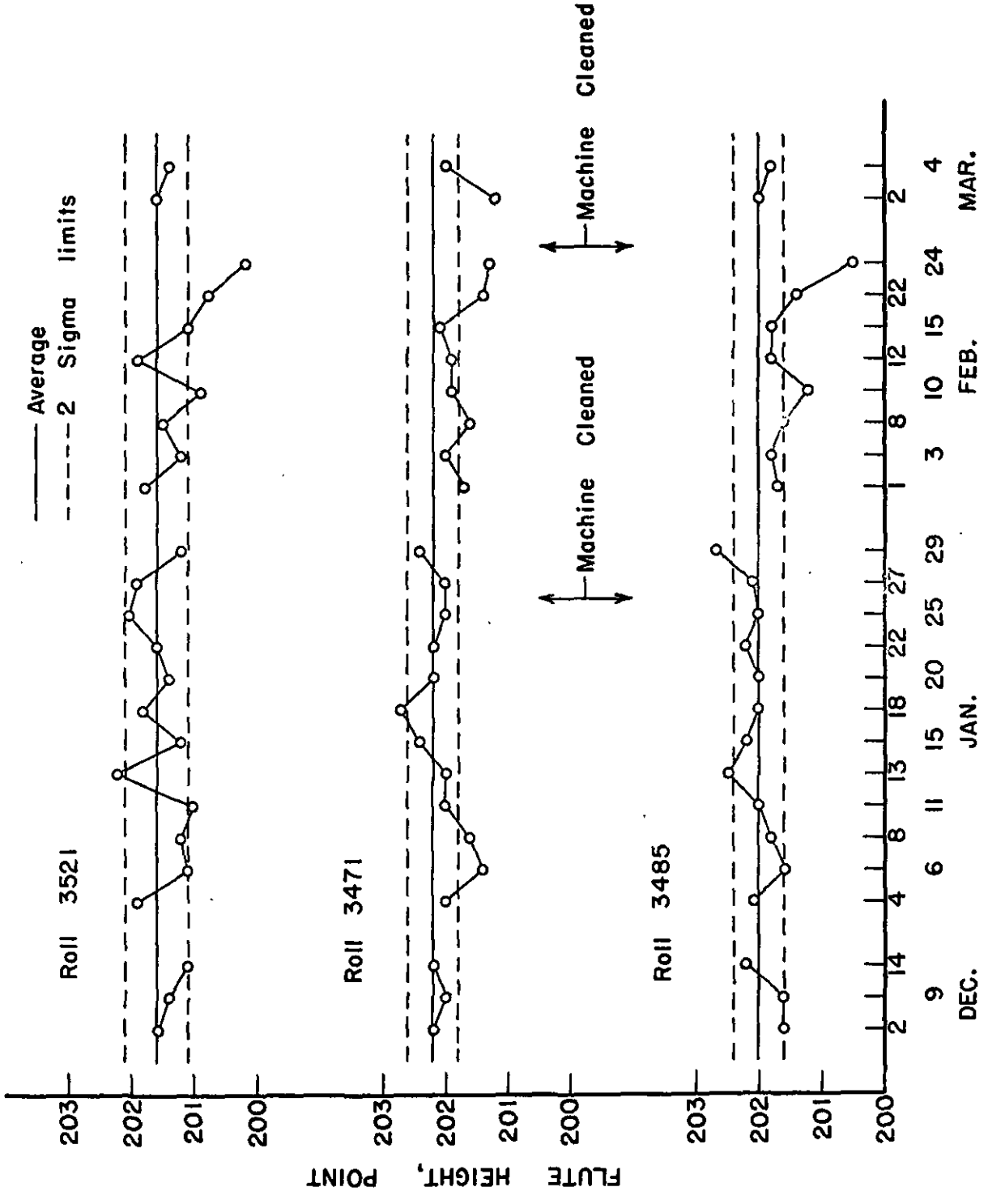

Fig. 2. Concora Flute Height Results for 26-lb. Medium Samples

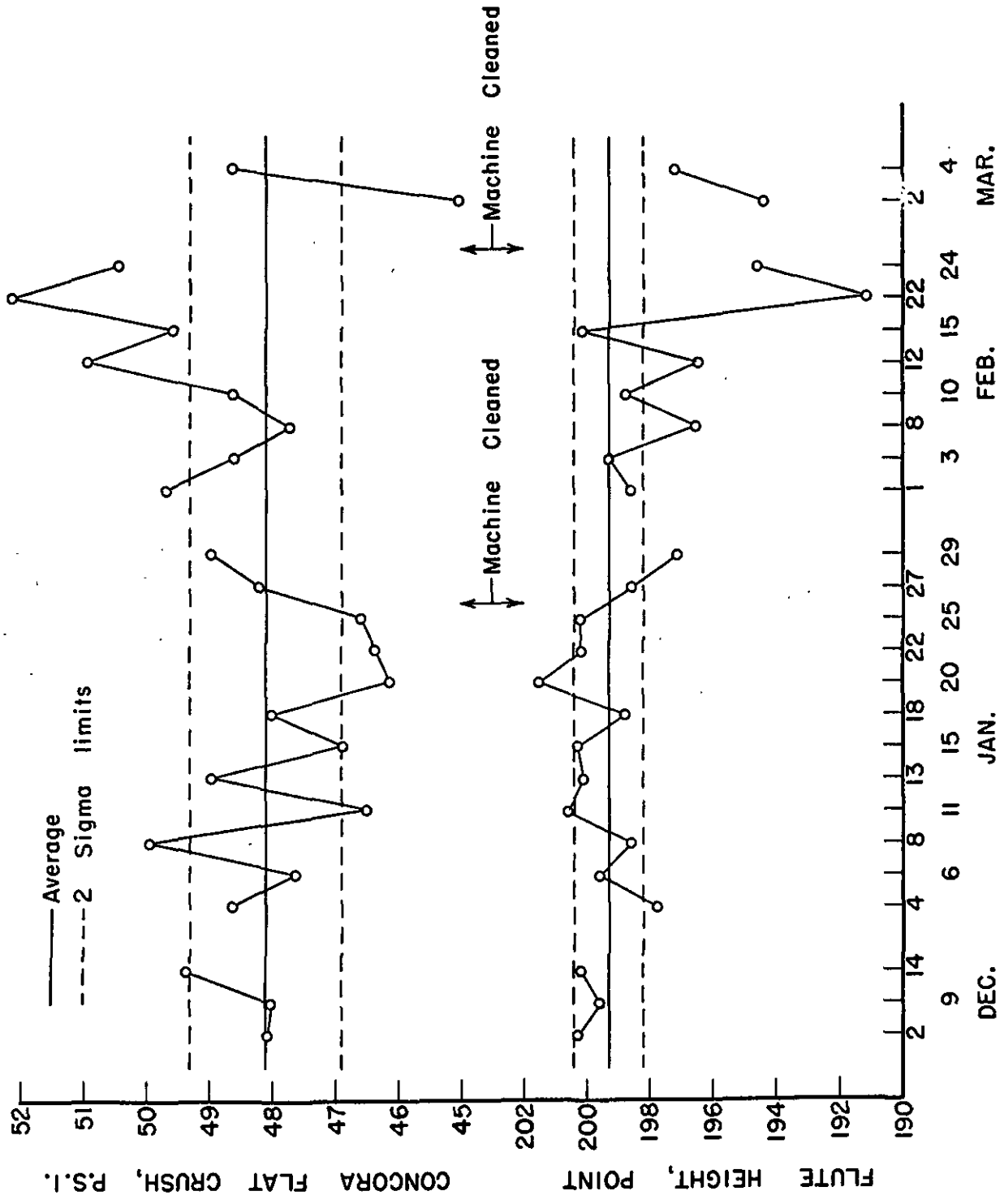

Fig. 3. Concora Flat Crush and Flute Height Results for the 33-lb. Medium Sample

graphite was brushed from the roll and hot plate surfaces. This action appeared to bring the test readings up to the proper level. During the latter part of February, high results were obtained. This was most noticeable with the 33-lb. medium sample but was also clearly evident in the 26-lb. medium results. After the trend was established, the roll and hot plate surfaces were cleaned, after testing on February 24 was complete, and lower results have been obtained since that date.

It may be recalled that the September flute height results were about 1 to 2 points higher than those obtained in October and November. For this reason the average lines shown in Fig. 2 and 3 are based on the October through February data. During December and January flute height remained relatively constant near the October-November levels and did not appear to correlate with the loss in flat crush observed during January. In February; however, a trend to lower flute heights may be observed which appears to be associated with the higher flat crush results obtained during this period.

Using the flat crush averages for all six months, the standard deviation of the sample averages was computed with the following results:

Roll No.	Grand Average, p.s.i.	Standard Deviation of Averages ($n = 20$)	Per Cent Standard Deviation
3521	40.6	1.07	2.6
3471	36.2	0.79	2.2
3485	32.7	0.70	2.1
3513	48.1	1.60	3.3

The above indicates that approximately 95% of the time the sample averages for Roll 3521 fall within about $\pm$ 5.2% of the grand average. Corresponding

figures for the other two samples would be ± 4.4 for Roll 3471 and ± 4.2 for Roll 3485. Somewhat wider limits are associated with the 33-lb. medium sample. These figures are, in general, somewhat greater than in the previous report, because they reflect the changes in test level during January and February.

In addition to the above, further trials were carried out involving the rack and comb. In Progress Report Two comparisons were made using a modified rack with the end sections cut away and 10- or 12-tooth combs. The modified racks reduced the difference in height between end and center flutes, and use of the 12-tooth comb seemed slightly more effective in this respect than the 10-tooth comb. An inconvenient aspect of the 12-tooth comb was that the tape tended to adhere to the end comb teeth. To remove this difficulty, the manufacturer was requested to consider manufacturing a rack with 12 rather than 10 flutes. This was delivered to the Institute during January and a small study was performed involving the following rack and comb modifications:

1. Original rack and comb
2. Modified rack (end sections cut away) with 10-tooth comb
3. 12-flute rack with 12-tooth comb

The results obtained are summarized in Table IX (all results are averages based on 10 specimens per condition). As may be noted, both the "end cut away" and 12-tooth racks reduced the differences in end-to-center flute height about equally; however, the greater convenience of the 12-tooth comb plus 12-flute rack would suggest that its use would be preferred. The only remaining problem--that of precrushing extra end flutes--has not appeared to affect results nor materially slow the test.

TABLE IX

COMPARISON OF VARIOUS RACK AND COMB MODIFICATIONS

Type of Rack	Type of Comb	Average Flute Height, points — Flute Number 1	2	3	4	5	6	7	8	9	10	Flat Crush, p.s.i.
						Roll No. 3471						
Original	10-tooth	209.2	202.2	203.6	203.8	203.5	204.2	203.7	203.5	202.8	215.2	37.0
End cut away	10-tooth	205.5	200.6	204.0	203.0	202.4	203.1	202.8	202.6	202.5	201.9	38.6
12-flute	12-tooth	204.9	202.3	203.6	203.0	203.4	202.8	203.6	203.1	202.8	203.6	37.3
						Roll No. 3485						
Original	10-tooth	210.2	201.4	203.4	203.4	202.7	203.6	203.2	202.6	202.4	214.6	33.3
End cut away	10-tooth	204.3	201.6	202.9	202.6	201.6	203.0	202.6	202.6	201.5	199.5	34.5
12-flute	12-tooth	205.6	202.2	202.8	202.6	202.8	202.8	202.4	202.7	202.2	203.2	34.7
						Roll No. 3521						
Original	10-tooth	207.4	201.0	203.4	202.8	202.2	203.2	203.2	202.8	201.2	215.2	40.6
End cut away	10-tooth	206.4	201.6	201.5	201.4	200.1	202.0	201.6	202.0	202.4	201.8	44.3
12-flute	12-tooth	205.9	201.8	202.5	201.6	202.1	202.0	201.8	202.4	201.6	204.2	41.5
						Roll No. 3513						
Original	10-tooth	211.4	201.0	201.6	201.7	201.0	202.4	202.2	201.6	200.8	217.2	49.4
End cut away	10-tooth	206.4	201.6	202.0	201.0	200.1	202.0	201.1	200.6	200.4	201.6	50.3
12-flute	12-tooth	205.1	200.8	199.4	198.5	199.1	199.8	200.2	200.3	199.2	201.7	49.1

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TABLE I

DEGREE OF RELATIONSHIP BETWEEN SINGLE-FACE FLAT CRUSH AND CONCORA FLAT CRUSH

Machine	No. of Samples	Correlation Coefficients: *Concora* Conditioned	Correlation Coefficients: *Concora* Unconditioned	Tabulated Values of Significance
A	54	0.68	0.56	0.27
B	53	0.88	0.76	0.27
C	56	0.63	0.27	0.26
D	56	0.70	0.60	0.26
E	20	0.75	0.77	0.44
F	20	0.62	0.54	0.44
G	22	0.45	0.61	0.42
H	41	0.89	0.84	0.31
I	57	0.77	0.80	0.26
J	48	0.79	0.79	0.28
K	46	0.70	0.50	0.29
L	42	0.55	0.32	0.30
M	44	0.51	0.40	0.30
N	30	0.71	0.81	0.36
O	51	0.69	0.54	0.28
P	49	0.52	0.57	0.28
Q	18	0.84	0.74	0.47
Composite	707	0.81	0.78	

Note: Tabulated values of significance are at the 5% level and are based on N-2 degrees of freedom.

TABLE II

REGRESSION COEFFICIENTS

Machine	Relationship: Single-Face versus Conditioned Concora — Intercept (a)	Slope (b)	Single-Face versus Unconditioned Concora — Intercept (a)	Slope (b)
A	3.556	0.787	14.189	0.405
B	0.999	0.888	8.351	0.530
C	14.360	0.543	26.687	0.183
D	7.412	0.724	13.811	0.438
E	8.214	0.672	13.675	0.411
F	6.409	0.738	11.876	0.448
G	17.029	0.407	16.532	0.316
H	0.172	0.893	6.584	0.587
I	7.184	0.719	7.425	0.573
J	7.471	0.709	5.547	0.611
K	8.041	0.709	15.803	0.401
L	13.912	0.540	23.853	0.213
M	14.143	0.524	20.043	0.282
N	7.484	0.623	10.860	0.462
O	13.506	0.531	21.763	0.240
P	19.647	0.380	15.119	0.398
Q	-3.175	0.982	10.321	0.470
Composite	4.962	0.772	10.081	0.503

Note: General form of regression equation is $Y = a + bX$
where Y = single-face flat crush
X = Concora flat crush

TABLE III

TEST OF SIGNIFICANCE OF THE DIFFERENCE IN SLOPES BETWEEN THE INDIVIDUAL MACHINES AND THE COMPOSITE REGRESSION LINES

	Relationship of Single-Face Flat Crush with A--Concora Conditioned Flat Crush				B--Concora Unconditioned Flat Crush			
Machine	Slope(b)	$b - b_o$	s_b	"t"	Slope(b)	$b - b_o$	s_b	"t"
A	0.405	-0.098	0.084	-1.17	0.787	0.015	0.117	0.13
B	0.530	0.027	0.063	0.43	0.888	0.116	0.083	1.40
C	0.183	-0.320	0.089	-3.60*	0.543	-0.229	0.091	-2.52*
D	0.438	-0.065	0.080	-0.81	0.724	-0.048	0.101	-0.48
E	0.411	-0.092	0.081	-1.14	0.672	-0.100	0.141	-0.71
F	0.448	-0.055	0.163	-0.34	0.738	-0.034	0.219	-0.16
G	0.316	-0.187	0.092	-2.03	0.407	-0.365	0.183	-1.99
H	0.587	0.084	0.060	1.40	0.893	0.121	0.071	1.70
I	0.573	0.070	0.059	1.19	0.719	-0.053	0.081	-0.65
J	0.611	0.108	0.070	1.54	0.709	-0.063	0.081	-0.78
K	0.401	-0.102	0.102	-1.00	0.709	-0.063	0.109	-0.58
L	0.213	-0.290	0.098	-2.96*	0.540	-0.232	0.128	-1.81
M	0.282	-0.221	0.099	-2.23*	0.524	-0.248	0.134	-1.85
N	0.462	-0.041	0.063	-0.65	0.623	-0.149	0.117	-1.27
O	0.240	-0.263	0.053	-4.96*	0.531	-0.241	0.079	-3.05*
P	0.398	-0.105	0.084	-1.25	0.380	-0.392	0.090	-4.36*
Q	0.470	-0.033	0.107	-0.31	0.982	0.210	0.162	1.30

Note: The tests of significance are of the form "t" = $\frac{b - b_o}{s_b}$ where:

b_o = the slope of the composite regression line which for relationship A is 0.503 and B is 0.772

s_b = the standard error associated with the slopes of the individual machines regression lines.

* Indicates significance at the 5% level.

TABLE IV

COMPARISON OF THE OBSERVED TO THE ESTIMATED SINGLE-FACE FLAT CRUSH

USING BOTH CONCORA FLAT CRUSH RESULTS FOR MACHINE H

Reporting Period	Concora Conditioned Flat Crush, p.s.i.	Single-Face Flat Crush, p.s.i. Estimated	Single-Face Flat Crush, p.s.i. Observed	Difference, %*	Concora Unconditioned Flat Crush, p.s.i.	Single-Face Flat Crush, p.s.i. Estimated	Difference, %*
June, 1959	44.3	39.7	38.5	+3.1	52.4	37.4	-2.9
	41.3	37.0	34.7	+6.6	54.2	38.4	+10.7
	45.2	40.6	39.4	+3.0	50.8	36.4	-7.6
July, 1959	44.4	39.8	39.0	+2.1	55.0	38.8	-0.5
August, 1959	39.0	35.0	35.5	-1.4	46.3	33.8	-4.8
	41.6	37.4	38.2	-2.1	46.9	34.1	-10.7
	43.1	38.6	38.0	+1.6	55.2	39.0	+2.6
	46.7	41.9	40.3	+4.0	58.7	41.0	+1.7
	42.1	37.8	38.8	-2.6	52.8	37.6	-3.1
	47.4	42.5	39.6	+7.3	57.6	40.4	+2.0
September, 1959	40.1	36.0	37.6	-4.3	54.7	38.7	+2.9
	43.7	39.2	41.1	-4.6	58.9	41.2	+0.2
	40.0	35.9	38.1	-5.8	53.0	37.7	-1.0
	41.3	37.0	34.8	+6.3	54.6	38.6	+10.9
	43.9	39.4	41.7	-5.5	55.8	39.3	-5.8
	41.2	36.9	39.6	-6.8	53.8	38.1	-3.8
October, 1959	47.2	42.3	41.3	+2.4	62.0	43.0	+4.1
	36.2	32.5	30.1	+8.0	41.5	31.0	+3.0
	40.0	35.9	37.1	-3.2	49.2	35.5	-4.3
	37.9	34.0	34.6	-1.7	51.5	36.8	+6.4
	35.2	31.6	31.8	-0.6	44.6	32.8	+3.1
	37.8	33.9	33.1	+2.4	46.7	34.0	+2.7
November, 1959	37.9	34.0	36.0	-5.6	46.8	34.1	-5.3
	39.1	35.1	38.0	-7.6	51.4	36.7	-3.4
	36.5	32.8	34.5	-4.9	46.8	34.1	-1.2
	44.0	39.5	41.9	-5.7	53.0	37.7	-10.0
	36.6	32.9	31.0	+6.1	44.2	32.5	+4.8
	42.7	38.3	39.6	-3.3	51.4	36.7	-7.3
	37.7	33.8	34.2	-1.2	45.8	33.5	-2.0
December, 1959	40.6	36.4	36.7	-0.8	50.0	36.0	-1.9
	34.1	30.6	30.7	-0.3	43.8	32.3	+5.2
	37.4	33.6	31.5	+6.7	46.4	33.8	+7.3
	34.9	31.4	30.8	+1.9	46.7	34.0	+10.4
	37.9	34.0	34.3	-0.9	47.3	34.3	0.0
	42.5	38.1	37.4	+1.9	53.6	38.1	+1.9
	40.1	36.0	35.6	+1.1	51.6	36.9	+3.7
	38.3	34.4	33.6	+2.4	44.9	32.9	-2.1
	37.3	33.5	31.5	+6.3	44.6	32.8	+4.1
	38.6	31.1	35.8	-13.1	48.5	35.0	-2.2
	34.9	31.4	30.6	+2.6	40.6	30.4	-0.7
	35.9	32.2	30.1	+7.0	43.7	32.2	+7.0

* Based on observed values as reference.

TABLE V

COMPARISON OF THE OBSERVED TO THE ESTIMATED SINGLE-FACE FLAT CRUSH

USING BOTH CONCORA FLAT CRUSH RESULTS FOR MACHINE L

Reporting Period	Concora Conditioned Flat Crush p.s.i.	Single-Face Flat Crush, p.s.i. Estimated	Single-Face Flat Crush, p.s.i. Observed	Difference, %*	Concora Unconditioned Flat Crush, p.s.i.	Single-Face Flat Crush, p.s.i. Estimated	Difference, %*
June, 1959	38.9	34.9	34.8	+0.3	45.7	33.6	-3.4
	37.2	34.0	32.0	+6.2	43.6	33.1	+3.4
	37.4	34.1	33.0	+3.3	46.9	33.8	+2.4
	36.7	33.7	34.2	-1.5	44.3	33.3	-2.6
	37.1	33.9	30.5	+11.1	46.1	33.7	+10.5
	37.3	34.1	33.6	+1.5	43.6	33.1	-1.5
	35.8	33.2	30.5	+8.9	41.9	32.8	+7.5
July, 1959	34.1	32.3	31.1	+3.9	41.8	32.8	+5.5
	39.5	35.2	35.8	-1.7	47.5	34.0	-5.0
	36.5	33.6	36.6	-8.2	41.6	32.7	-10.7
	34.7	32.6	34.6	-5.8	45.1	33.5	-3.2
	35.3	33.0	32.3	+2.2	41.3	32.6	+0.9
	39.7	35.4	35.2	+0.6	48.1	34.1	-3.1
August, 1959	37.2	34.0	35.7	-4.8	48.2	34.1	-4.5
	37.2	34.0	35.0	-2.9	40.4	32.5	-7.1
	37.4	34.1	37.0	-7.8	42.6	32.9	-11.1
September, 1959	36.4	33.6	30.7	+9.4	44.6	33.4	+8.8
	36.6	33.7	35.3	-4.5	43.9	33.2	-5.9
	37.4	34.1	34.2	-0.3	43.9	33.2	-2.9
	33.8	32.2	31.1	+3.5	43.2	33.0	+6.1
	35.9	33.3	33.9	-1.8	45.3	33.6	-0.9
October, 1959	36.7	33.7	35.8	-5.9	47.9	34.0	-5.0
	33.5	32.0	30.4	+5.3	43.3	33.1	+8.9
	34.8	32.7	32.2	+1.6	41.4	32.7	+1.6
	34.9	32.8	34.3	-4.4	40.0	32.4	-5.5
	34.7	32.6	34.8	-6.3	44.6	33.4	-4.0
	36.7	33.7	33.3	+1.2	48.6	34.2	+2.7
	36.7	33.7	31.2	+8.0	43.2	33.0	+5.8
	34.8	32.7	31.8	+2.8	42.7	33.0	+3.8
November, 1959	35.0	32.8	33.0	-0.6	45.7	33.6	+1.8
	33.0	31.7	32.9	-3.6	49.1	34.3	+4.3
	35.0	32.8	32.4	+1.2	47.0	33.9	+4.6
	35.4	33.0	34.2	-3.5	45.0	33.4	-2.3
	34.8	32.7	33.9	-3.5	45.2	33.5	-1.2
	32.9	31.7	32.3	-1.9	39.4	32.2	-0.3
December, 1959	35.9	33.3	33.7	-1.2	43.9	33.2	-1.5
	31.0	30.6	30.5	+0.3	38.2	32.0	+4.9
	35.8	33.2	32.3	+2.8	46.6	33.8	+4.6
	37.6	34.2	34.9	-2.0	45.1	33.5	-4.0
	34.6	32.6	32.5	+0.3	44.3	33.3	+2.5
	33.1	31.8	30.6	+3.9	39.6	32.3	+5.6
	39.2	35.1	34.1	+2.9	49.3	34.4	+0.9

* Based on observed values as reference.

TABLE VI

RELATIONSHIP OF CONDITIONED TO UNCONDITIONED

CONCORA FLAT CRUSH AND SIGNIFICANCE VALUES

Machine	No. of Samples	Intercorrelation Coefficients	Tabulated Values of Significance
A	54	0.76	0.27
B	53	0.76	0.27
C	56	0.46	0.26
D	56	0.76	0.26
E	20	0.81	0.44
F	20	0.58	0.44
G	22	0.61	0.42
H	41	0.87	0.31
I	57	0.86	0.26
J	48	0.74	0.28
K	46	0.66	0.29
L	42	0.53	0.30
M	44	0.52	0.30
N	30	0.85	0.36
O	51	0.65	0.28
P	49	0.65	0.28
Q	18	0.76	0.47
Composite	707	0.81	

Note: Tabulated values of significance at the 5% level.

TABLE VII

DISTRIBUTION OF THE PER CENT DIFFERENCES BETWEEN OBSERVED AND COMPUTED SINGLE-FACE FLAT CRUSH VALUES

Machine	Concora Test Conditions	No. of Samples	Distribution, %				
			± 2%	± 4%	± 6%	± 8%	±10%
H	Conditioned	41	26.8	53.7	73.2	95.1	97.6
H	Unconditioned	41	22.0	56.1	75.6	87.8	87.8
L	Conditioned	42	35.7	66.7	81.0	88.1	97.6
L	Unconditioned	42	21.4	47.6	81.0	88.1	92.9

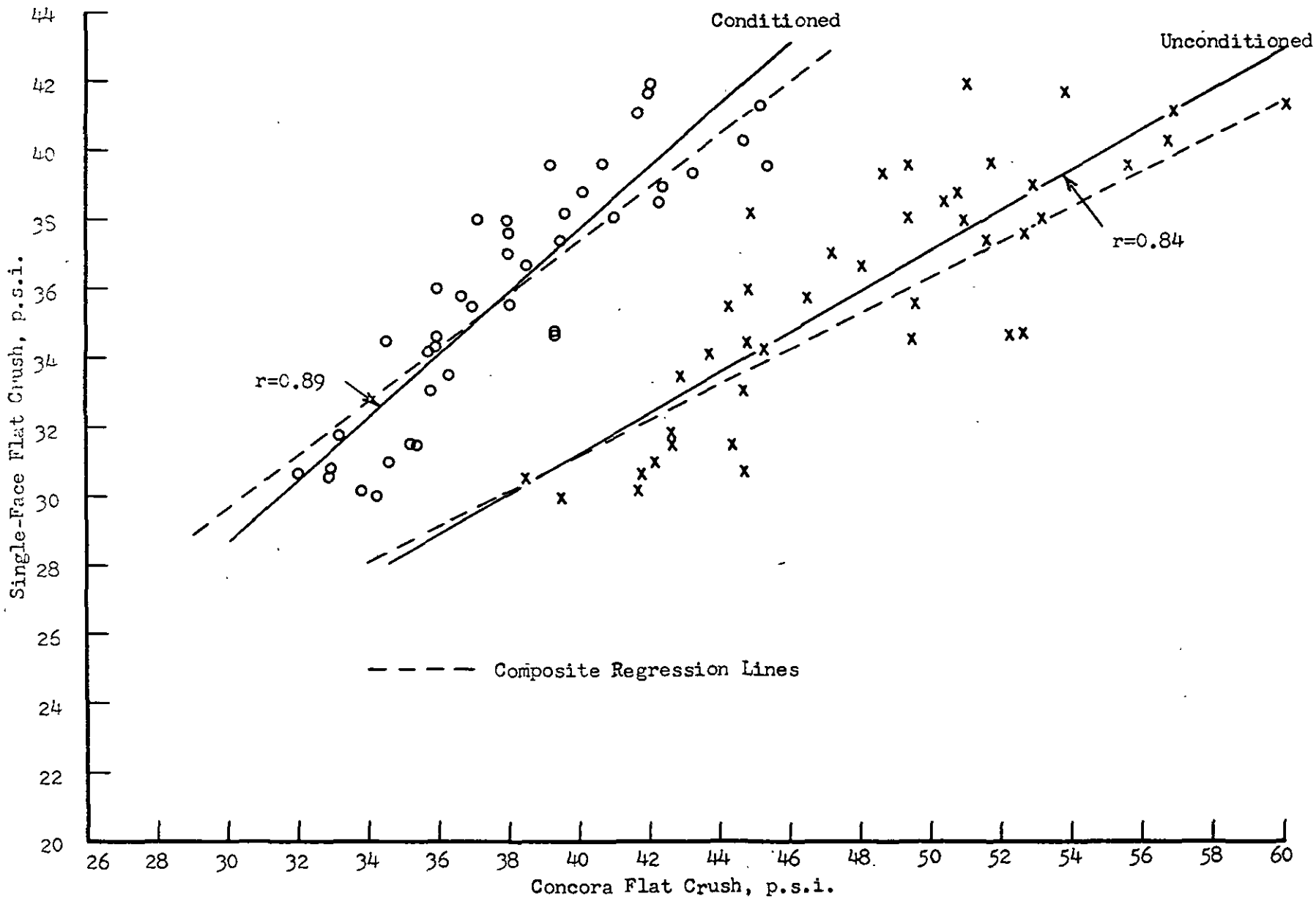

Fig. 1. Single-Face Flat Crush versus Concora Flat Crush for Machine H

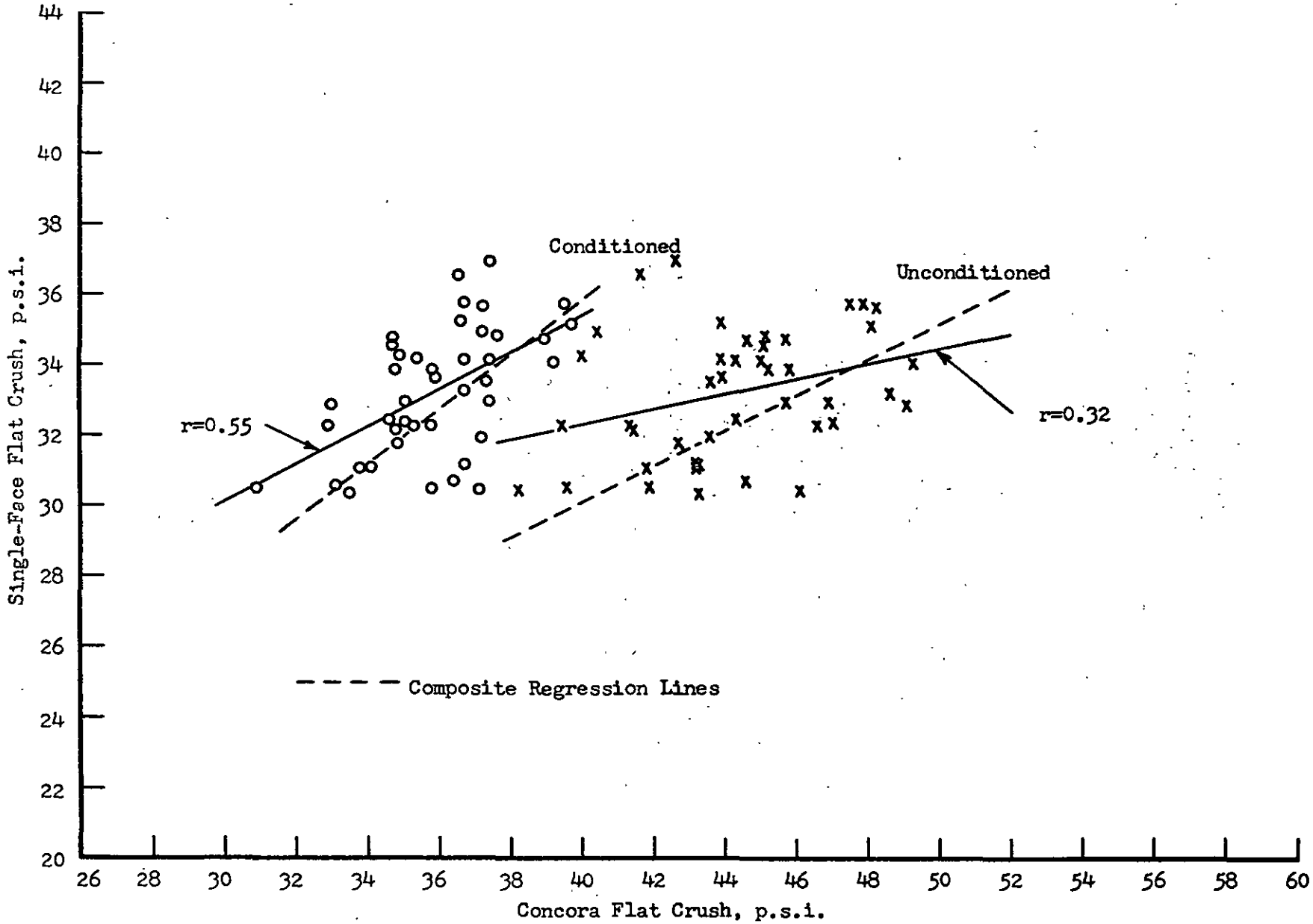

Fig. 2. Single-Face Flat Crush versus Concora Flat Crush for Machine L

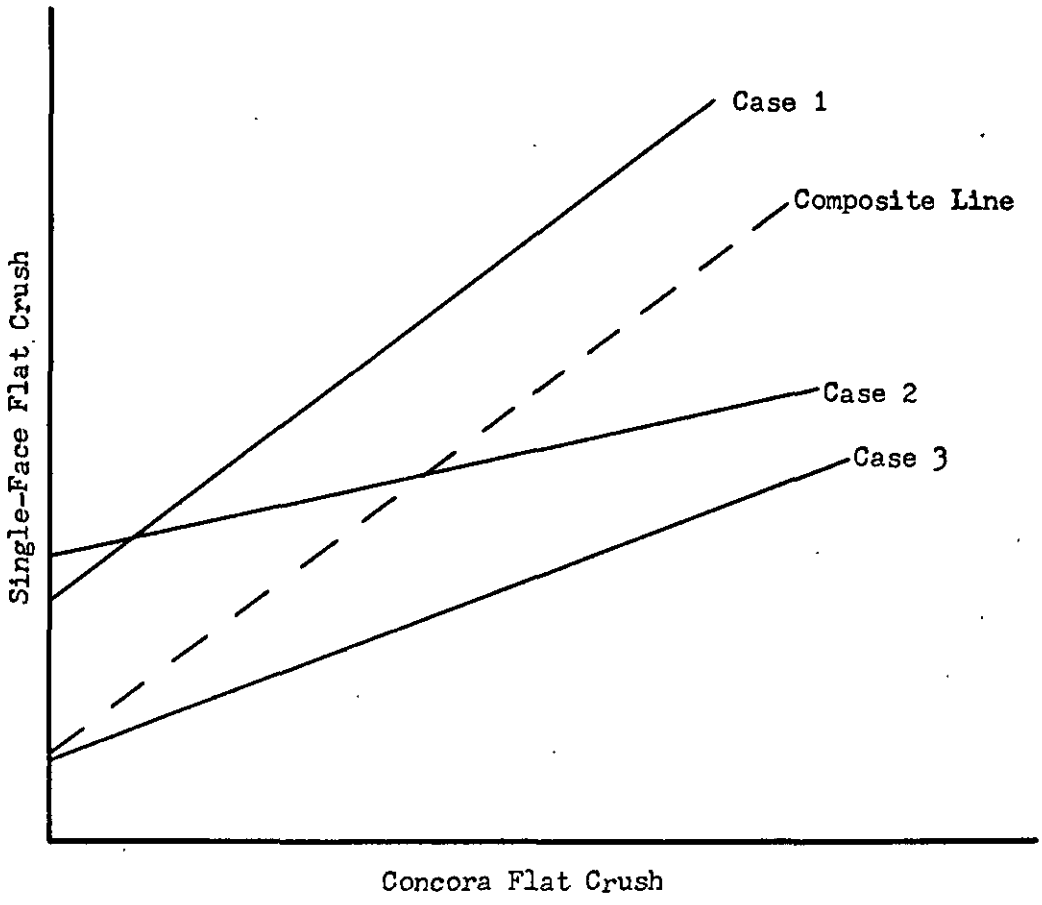

Fig. 3. Comparison of Regression Lines